Fiscal Year 2007

Map Modernization Plan for

The State of Wisconsin

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Introduction

The nation's floodplain maps are outdated and poorly defined. FEMA has established a broad goal of modernizing flood hazard maps nationwide and presented a plan to Congress to address these concerns. This plan was accepted and funded by Congress and is now referred to as the Flood Map Modernization Plan. In this plan, FEMA has acknowledged that collaborative partnerships with state, regional and local organizations will be necessary.

Pending in Congress is an authorization bill to increase map modernization funding to $300 million each year and to extend the timeline to 2012. FEMA recognizes that each project requires a two year funding cycle, so the current plan is to have every county in the State mapped and to have all maps adopted by 2014.

States with interest and capability to assist with FEMA's multi-hazard flood map modernization effort have been asked to prepare a Business Plan detailing how the state and local mapping activities will contribute to FEMA's multi-hazard flood map modernization goals and objectives.

This Plan identifies the role the State of Wisconsin is requesting to play in Map Modernization Implementation and how these activities will be managed and performed by WDNR.

Background

Floods are the nation's most common and costly natural disaster. To reduce the ever-growing expense to the federal government related to flooding, Congress established the National Flood Insurance Program (NFIP) in 1968. The NFIP guarantees that flood insurance will be available in communities that agree to adopt land-use regulations so that new development is reasonably protected from potential flood damages.

Flood Hazard Maps produced by the NFIP are one of the basic and essential tools for flood insurance, floodplain management and flood hazard mitigation. However, due to the manual cartographic processes used and limited topographic information available when they were initially developed, today's flood hazard maps are inadequate to meet the current needs. Recognizing the need to upgrade the existing maps, FEMA developed a Flood Map Modernization Plan, which was funded based on Congressional backing beginning in FY03.

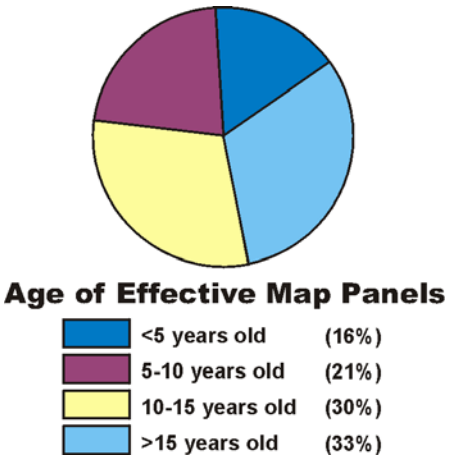
FEMA has developed the following Flood Map Modernization Key Performance Indicators:

- Percentage of population with digital GIS flood data available on-line,
- Percent of population with adopted maps that meet quality standards.

The Wisconsin Experience

Floods cause a significant threat to life and property in Wisconsin. Wisconsin is tenth in the nation in documented flood damages. Flooding was a principle cause in 16 out of 24 Presidential Disaster Declarations in Wisconsin from 1971 through 2001.

As shown in the figure below, most of the flood hazard maps in **Wisconsin** are outdated.



In many cases, the older maps reflect outdated flood hazard information that limits their utility for insurance and floodplain management purposes. Most of the maps were prepared using now outdated road network information and manual cartographic techniques, which introduced errors and make the maps difficult for State and local customers to use and expensive to maintain. In addition, there is development pressure on some Wisconsin streams and lakes where the flood hazard has not yet been mapped**.**

Wisconsin Floodplain Management Legislation

When Wisconsin became a state in 1848, rights of navigation of state waterways were incorporated into the State Constitution. The Wisconsin constitution indicates that navigable waters in the State of Wisconsin are held in trust for the citizens of the United States. Since becoming a state, a sizeable body of common law has established that the State has the affirmative duty to protect and preserve these public trust waters. This is called the Wisconsin Public Trust Doctrine.

Following major floods in 1965, the state legislature created Chapter 87.30. This chapter of the state statutes requires communities to enact floodplain zoning and requires the State to "ensure that hydrologic and engineering studies are reasonable and accurate". Since this chapter of the statutes was created, Wisconsin has reviewed and if "reasonable and accurate", approved hydrologic and engineering studies used to develop floodplain zoning maps. WDNR maintains an archive of these approved flood hydrologic and hydraulic models.

Wisconsin has developed floodplain engineering standards specific to Wisconsin:

- Wisconsin has what is called a "zero rise floodway". Model encroachments are not allowed. Once the "zero-rise" floodway is established, before any encroachment into the floodway that causes a measurable rise (.01 feet) can occur, easements must be obtained from the affected landowners.

- Wisconsin floodplain standards require that for any flood hazard area to be removed from the floodplain, the area must be filled to one foot above the regulatory flood elevation and the first floor of any structure built on the fill must be 2 feet above the regulatory flood

elevation. This helps account for ice and debris blockages and other uncertainties associated with flood height predictions when landowners are building in a mapped flood hazard area.

In addition to authorizing legislation and higher engineering standards than the minimum required by federal law, WDNR has the in-house engineering and Geographic Information System (GIS) technical expertise needed to successfully manage Flood Map Modernization in Wisconsin. WDNR has sixteen (16) Water Management engineers trained in hydrology and hydraulics working in floodplain management, dam safety and water regulation permitting. WDNR Water Management Engineers assist zoning administrators by doing the modeling necessary to set Regulatory Flood Elevations (RFEs) in Approximate Zones.

In August of 2000, the Wisconsin legislature provided WDNR with funding to enhance the use of information technology (specifically GIS) to improve staff effectiveness and customer service in the water management programs. This budget item (called the Wisconsin Waters Initiative) provided funding to:

- Improve WDNR's IT infrastructure;
- Provide GIS tools and training for staff;
- Georeference FEMA's scanned FIRMs;
- Develop a GIS data layer identifying the streams with detailed studies and streams with approximate studies;
- Link the archived models associated with detailed studies to the related stream segment;
- Enhance the georeferenced FIRMs so that they can be viewed over Digital Orthophotos or USGS scanned topographic maps;
- Make the georeferenced floodplain maps and the associated models available over the web via a "clickable map" **http://maps.dnr.state.wi.us/fad;** and
- Develop an inventory of digital elevation data in Wisconsin.

Pending approval from Wisconsin Department of Administration, WDNR will be fully staffed in 2006 to take on all GIS and planning activities. Some engineering tasks will be conducted in-house, but the majority will be contracted out to Wisconsin engineering consulting firms.

State Role in the Flood Hazard Mapping Program

Level of Participation—Wisconsin is a Managing State.
Lead agency: The Wisconsin Department of Natural Resources is the agency responsible for the floodplain management program mandated by state statutes.

Other agencies and/or organizations involved, and their roles:

- **The Wisconsin Land Information Program (WLIP)**– Wisconsin passed legislation in 1989 funding the automation of land records. The legislation listed zoning as one of the six foundational elements. Funding from this program has enabled all 71 non-tribal counties in Wisconsin to develop GIS capability and create extensive local base data. Because of the Wisconsin Land Information Program, the quality and extent of base mapping available will substantially improve the integrity of the DFIRMs and minimize data acquisition costs.

- **Wisconsin Land Information Board (WLIB)** – The legislature created this board to oversee the implementation of the WLIP. Although this board has now dissolved, it had representatives from DOA, DNR, DOT, the Department of Agriculture, Trade and Consumer Protection (DATCP), local governments and is chaired by the State Cartographer. The Wisconsin Land Information Board had some discretionary funding for strategic initiatives. In FY 03, the Board created a new strategic initiative grant category to support Wisconsin's Map Modernization Implementation Plan and allocated $268,000 for Flood Map Modernization projects in Wisconsin. Grants were awarded to six counties for elevation data development or the collection of bridge metrics needed for Flood Map Modernization.

- **Wisconsin Emergency Management (WEM)** – Flood Insurance Rate Maps are used by WEM for disaster response and flood hazard mitigation. WEM develops the State Hazard Mitigation Plan and manages FEMA funding to communities for development of community Hazard Mitigation Plans and flood hazard mitigation projects.

- **Wisconsin Dept. of Transportation (DOT)** – WDOT conducts hydrologic and hydraulic analyzes on proposed bridges over waterways to determine if proposed bridges will increase flood profiles. WDNR and WDOT have a Memorandum of Understanding to address situations where the flood profile upstream of bridges is increased. WDOT develops topographic data when building bridges. Since bridges create restrictions that backup water and increase flood heights, topographic data at stream crossings is useful for hydraulic modeling. In addition, WDOT has initiated a height modernization project to upgrade the vertical control network in Wisconsin.

- **Wisconsin Department of Administration (DOA)** – DOA is providing assistance to ensure proper staffing levels at the DNR on this project. Wisconsin's Geographic Information Officer (GIO) resides at this office and offers assistance to WDNR on issues relating to spatial data that affect other State agencies.

- **United States Geologic Society (USGS)** – USGS is working on an initiative to resample current digital orthophotography and add it into the public domain. WDNR may use this imagery as a base when producing DFIRM map panels.

- **Wisconsin State Cartographers Office (SCO) –** Wisconsin's State Cartographer attends planning meetings and provides guidance on mapping related issues that affect other State partners. Staff at SCO may provide assistance with maintaining inventories of elevation and bench mark data. They may also offer technical guidance on issues pertaining to local map projections to WDNR GIS staff.

- **Farm Service Agency (FSA) –** The FSA was responsible for creating a statewide digital orthophoto layer in 2005 that WDNR is using as a base layer for many DFIRM map panels.

- **Southeast Wisconsin Regional Planning Commission (SEWRPC)** – SEWRPC has engineering staff devoted to floodplain and stormwater modeling and mapping. They are committed to providing the most up to date modeling and mapping to be used as leverage in the map modernization initiative.

Wisconsin DNR's Map Modernization Goals

1. To serve our customers, the local communities and public of Wisconsin, and to ensure that flooding sources depicted on FEMA Flood Insurance Rate Maps are accurate enough for local zoning administrators to make reasonable determinations case by case.

2. To facilitate partnerships with Wisconsin communities and leverage existing resources when available.

3. To reduce appeals and minimize future maintenance costs.

All floodplain maps provided to communities for adoption will be "reasonable and accurate" when compared to best available topographic and community base map data.

Wisconsin Priorities

With these goals established, FEMA funding will be used for:

- Ensuring that flood hazards in areas with the highest development pressure have up to date flood profiles and mapped floodways. This will guarantee that at a minimum all incorporated communities and their extraterritorial jurisdictions will have flood profiles and mapped floodways;

- Guaranteeing that existing detailed studies and approximate areas are adjusted to match best available topographic data;

- Providing technical guidance to communities that would like to use their own resources to conduct new studies and incorporate them into the new DFIRMs.

Topographic Data

The availability of topographic data has a significant impact on both benefits and costs associated with floodplain mapping. Digital topographic data available in Wisconsin is generally from one of two sources – USGS or local government. The topographic data sets available are:

- USGS – 30 meter DEMs, 10 meter DEMs, DRGs, DLGs, and TVCs; and
- Local Government – LiDAR, DTMs and contour lines.

WDNR's GIS Section has incorporated USGS's DRGs and 30 meter DEM[1]s into WDNR's Geospatial Infrastructure.

USGS 30 Meter Digital Elevation Models (DEMs) - While not adequate for hydraulic modeling or floodplain mapping, USGS's 30 meter DEMs have utility in hydrologic modeling. WDNR

[1] These are both statewide data sets.

hydrated the Statewide 30 meter DEM with its hydrography GIS framework data layer and used it in the development of the Wisconsin Floodplain Hydrology Tool.

USGS DRGs – USGS calls their scanned and georeferenced 7 and ½ minute quadrangle maps Digital Raster Graphics or DRGs. Most floodplain maps in Wisconsin were developed using the contour lines on the USGS 7 and ½ minute quadrangle maps (quads). DRGs are not in a format that allows them to be used in any of the automated H&H or floodplain mapping tools that have become prevalent in the last decade. However, in parts of the state where the contours on the quads are the best available topographic data, they are useful in evaluating the accuracy of digital floodplain maps developed under this initiative.

USGS Digital Line Graphs (DLGs) and Tagged Vector Contours (TVCs) - WDNR has obtained DLGs and TVCs where available from USGS. These vector topographic data *can* be used in automated H&H and floodplain mapping tools and are generally adequate for floodplain redelineation and limited detail studies where no better topographic data is available.

Local Government LiDAR, Digital Terrain Models (DTMs) and derived contours– Locally developed topographic data in Wisconsin are usually equivalent to 2 foot or 4 foot contours. DTMs are the most useable format for GIS automated H&H and mapping tools. Contour lines are not quite as easy to use but generally are adequate for using with automated H&H and floodplain mapping tools. As indicated earlier, the Wisconsin Land Information Program has had a significant impact on the development of topographic and other GIS data in Wisconsin counties. WDNR maintains an inventory (Map 1) of which local governments have developed these 2 or 4 foot contour topographic data sets and has factored this information into the Wisconsin Flood Map Modernization priority list.

Mapping Needs Assessment and Priority Setting Approach

In FY 02, WDNR received FEMA Community Assistance Program funding to evaluate the mapping needs in Wisconsin and develop the state's Map Modernization Implementation Plan.

WDNR field engineers surveyed communities to document community needs. Thirteen of Wisconsin's Water Management Engineering positions are located in field offices. These field engineers have routine contacts with community floodplain zoning administrators – making them knowledgeable about the floodplain mapping needs in the state. In addition, Wisconsin DNR has 2 planners and 30 water management specialists that work with community zoning staff on shoreland, wetland and floodplain zoning on a regular basis.

Wisconsin DNR created a GIS data layer that identifies all of the waters in the state that presently have detailed studies, approximate mapping and mapping needs.

This mapping needs assessment included the following tasks:

- Soliciting mapping needs information from counties and communities;
- Reviewing available community-specific data (e.g. an inventory of Digital Terrain Model data has been developed);

- Conducting a benefit analysis on all streams that need to be remapped using the MNUSS benefits calculation formulas and U.S. Census data. The major focus of the MNUSS benefit calculation formulas was housing density and growth;

- Estimating costs - Watershed Concepts assisted WDNR in the cost analysis. The cost analysis took into account the availability of adequate topographic, base map and modeling data and the mapping needs for each county; and

- Generating a priority listing by county based on population and topographic data available.

Although we realize that new detailed studies may not be an option for upcoming years, we still maintain a record of these needs.

….If you build it we will come

In the first few years of the Flood Map Modernization Initiative, Wisconsin focused on counties with improved topographic data. In our outreach efforts over the past decade, WDNR has promoted the development of improved topographic data at statewide and regional meetings of local government officials, floodplain managers, zoning administrators and GIS staff. We have repeatedly encouraged counties to improve their topographic data and offered to move them up on Wisconsin's floodplain mapping priority list if they do so. We are aware of several counties in the process of developing improved countywide topographic data sets – Barron, Oconto, Outagamie, Sauk, Walworth and Waupaca. Another county on the FY06 sequence, Green Lake, has countywide 4 foot contours.

If a county that presently does not have adequate topographic data for floodplain mapping later develops it, the ranking may be adjusted.

Wisconsin's Plan for FY07

For FY07, Wisconsin will manage all aspects of the flood remapping effort and conduct much of the work in-house for eleven counties. In partnership with FEMA, we will generate reasonable and accurate flood hazard maps for all of the water bodies in the identified eleven counties where a flood risk is currently mapped on existing FIRMs.

WDNR will contract out for redelineation with local Wisconsin consulting firms who are experienced in the use of geospatial tools for engineering and mapping. This will minimize costs and help to ensure that the flood hazard maps generated fit local base mapping and best available topography.

WDNR engineers will be available to provide H&H guidance to communities should they be interested in using their own funds to collect new flood study data. We will not be directly involved with creating any new flood hazard data, but will be agreeable to incorporating new data that we receive provided it meets all FEMA guidelines and is presented within the allotted timeframe.

Three full time engineers will each be assigned a number of counties to coordinate and carry out engineering activities. These tasks will include providing H&H technical guidance to counties if requested, supporting contractors as they work through redelineation assignments,

quality checking data submitted by contractors, working with GIS staff to merge detailed data with zone A linework, creating flood profiles and Flood Insurance Study (FIS) reports, and generating Summary of Map Action (SOMA) lists. Engineering staff will be responsible for providing status updates using the MIP workflow tools.

WDNR will assign two GIS Project Lead/Analysts to oversee all GIS activities on four counties, and another GIS Project Lead/Analyst to oversee three counties. These activities will include acquiring and reviewing base data layers, coordinating zone A redelineation with our GIS shop, quality checking data submitted from the contractors, merging zone A with redelineated linework, creating DFIRM geodatabases and ensuring correct topology, developing workmaps for local community review, and coordinating and performing map panel production. While working through these tasks, our GIS staff will also be assigned to perform proper updates to the MIP workflow tools and to use the DFIRM tools for map panel production.

We will also hire three planners to coordinate post preliminary processing tasks for the eleven counties. Four counties will be assigned to two planners and another three counties will be assigned to the third. These staff will be responsible for distributing preliminary products, all post preliminary tasks, reviewing ordinances and coordinating scoping meetings.

Our GIS Services section has assigned three technicians to the tasks of redelineating zone A's and using the DFIRM tools to create map panels. Our GIS Project Leads will be responsible for coordinating this work and reviewing it to ensure compliance with FEMA standards.

In addition to three GIS Project Leads/Analysts, three Engineers, three Planners and three GIS Technicians, we will also have on staff one GIS Coordinator, one Engineering Coordinator, one Financial Specialist/Planning Coordinator and one Map Modernization Grant Coordinator. The addition of these positions will ensure all activities are synchronized and that progress will be reported to FEMA in a timely and effective manner.

WDNR will ensure that all vector planimetric and flood hazard GIS layers will be stored in a DFIRM geodatabase data model according to FEMA standards. Elevation data, which is used for flood delineation purposes, and imagery used as a base to the printed maps, will be stored on FEMA's central repository. Both the imagery and elevation data will meet National Standard for Spatial Data Accuracy (NSSDA) guidelines. A metadata file will accompany all data submittals and will be consistent with Federal Geographic Data Committee (FGDC) and FEMA guidelines.

WDNR will work with local communities, counties, regional planning commissions and other state agencies to encourage sharing of resources. All data collected during this initiative will be integrated with other programs and systems, where deemed necessary, to most effectively improve the accuracy and utility of the digital GIS flood hazard boundary maps.

We believe that this business plan effectively contributes to FEMA's Flood Map Modernization objectives, which are to:

- Establish and maintain a premier flood-hazard data collection and delivery system;
- Achieve effective program management;
- Build and maintain mutually beneficial partnerships; and
- Expand and better inform the user community.

Taking on this work now will ensure that WDNR will be ready to perform similar functions in future years of the project and to tackle ongoing maintenance issues. Currently, we have proposed a feasibility study to begin analyzing how map maintenance will work after map modernization, and also how our local partners can become more involved.

Accomplishments to date

In FY04, WDNR:

- Upgraded the Wisconsin DNR Hydrology Tool to be compatible with ArcMap version 9.0;
- Developed a State Business Plan, Cooperating Technical Partner agreement and the Mapping Activity Statements associated with establishing Wisconsin as a Managing State for FEMA's Flood Map Modernization initiative;
- Received approval from the Wisconsin Department of Administration to fill four project positions, 2 GIS and 2 engineering;
- Hired two full time engineering staff and two full time GIS staff. Additionally, hired one full time Project Manager and two GIS limited term employees (LTEs);
- Issued a Request for Proposal to the consultants that had been prequalified;
- Contracted with three local consulting companies to do hydraulics and mapping in Ozaukee, Waukesha, Dane and Rock Counties;
- Completed the WDNR portion of the Brown County Flood Map Modernization Project;
- Worked through the scoping process in Ozaukee, Waukesha, Rock, Milwaukee and Dane Counties;
- Conducted a technical workshop for counties on the collection of topographic data and bridge/culvert data;
- Provided technical assistance to Fond du Lac County associated with a bridge/culvert inventory;
- Implemented project management, status reporting and financial reporting procedures;
- Updated the Wisconsin topographic data inventory and revised the Wisconsin county ranking based on that inventory;
- Obtained TVCs (tagged vector contours) and DLGs (digital line graphs) from USGS;
- Completed all modeling, mapping, and documentation for Ozaukee County including the flood profiles and FIS report.
- Completed hydrologic modeling for Dane and Rock counties;
- Gathered data and finished pre-scoping projects for the 11 new counties for FY05;
- Nearly completed FIS reporting, flood profile generation and mapping review for Burnett, Columbia and LaCrosse Counties;
- Attended numerous status meetings with SEWRPC to discuss Milwaukee, Waukesha and Ozaukee counties; and
- Received funding to participate in FY05 partnership agreement with FEMA's IDIQ contractor.

In FY05, WDNR:

- Completed hydrologic modeling for Dane, Rock and Waukesha counties;
- Provided H&H support for Dane, Waukesha and Rock counties;
- Produced preliminary map panels and held open houses in Ozaukee County;

- Completed a pilot project using the WISE modeling package in Fond du lac county;
- Negotiated a partnership contract with FEMA's IDIQ contractor for 11 new counties including Adams, Calumet, Door, Eau Claire, Fond du lac, Jefferson, Kenosha, Racine, Sheboygan, St. Croix, and Washington;
- Assisted in scoping and outreach for these 11 counties;
- Attended training for DFIRM tools on the MIP; and
- Contracted with USGS to create TVCs in Washington and Adams counties.

Funding Shortfall

This plan does not take into account our original goals of creating new detailed studies, restudying problem areas and building limited detail studies in existing approximate zones. Our original business plan identified the need to produce new studies at areas with significant development pressure, which equated to 30 linear miles in most counties. That plan also addressed the need to restudy certain areas where the existing model is inadequate to map. Our original estimates showed that WDNR would need three times the funding that currently exists in order achieve those goals.

We still feel that in order to meet the needs of our local partners and successfully identify flooding risks, new studies and maps should be produced. However, we are accepting the fact that the type of funding required to properly map all flooding sources throughout the State is simply not available. This plan makes use of actual dollars and identifies a strategy to provide the best product possible, given those limitations.

Project Sequencing

With this FY07 funding plan we are agreeing to take on these six new counties, with an additional five counties to be determined: Barron, Dodge, Oconto, Outagamie, Sauk, and Waupaca.